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Verbakel et. al.

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Title: A Method, Device, And Information Structure For Storing Audio-Centered Information With A Multi-Level Table-Of-Contents (TOC) Mechanism And Doubling Of Area-TOCs, A Device For Use With Such Mechanism And A Unitary Storage Medium Having Such Mechanism

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to calculation of the filing fee please enter the following Amendment.

IN THE TITLE

Please cancel the title and substitute the following new Title:

"Storing Audio-Centered Information With A Multi-Level Table-Of-Contents (TOC) Mechanism Having Redundant Sub-TOCs"

IN THE DESCRIPTION

Please change the paragraph beginning on page 1, line 9 to read as follows.

Storing digital audio on unitary media such as disc or tape is

widespread. In case of actual sub-division of the audio into multiple sub-items, providing a Table-of-Contents (TOC) allows to access the information in an easy manner. Such TOC will specify at least what has been stored and where it has been stored. The audio may be defined according to various standardized audio formats, such as two-channel stereo, multiple (5-6) channel audio such as in surround sound applications, and possibly others. An audio provider may wish to combine various track areas having the same and/or different such formats on a single medium such as an optical disc.

Please change the paragraph beginning on page 1, line 20 to read as follows.

In consequence, amongst other things, it is an object of the present invention to allow an audio management system to allow a user to access various audio track areas in a fast and easy manner. A user is now able to distinguish between various track areas and to navigate among the various items of a single track area in a robust manner, and if possible, without encumbrance through data errors in the TOC itself.

Please change the paragraph beginning on page 2, line 5 to read as follows.

Figures 1a and 1b depict a record carrier of the invention;
Figure 2 depicts a playback device of the invention;
Figure 3 depicts a recording device of the invention;
Figure 4 depicts a file system invention used in the record carrier of figure 1;
Figure 5 depicts a storage arrangement invention for the record carrier of figure 1; and
Figure 6 depicts a data structure invention for an audio area

of the record carrier in figure 1.

IN THE CLAIMS:

Please cancel claims 1-9.

Please add the following new claims:

10. A method for producing a unitary storage medium, comprising the steps of:

providing at least two mutually logically conforming sub-TOCs for the same track area in one or more track areas of a unitary storage medium, each sub-TOC having structures for storing information for determining the configuration of the same information items stored in the track area, thereby allowing retrieving the configuration of the same information item in the track area from at least any correct copy of the sub-TOCs; and

providing at least one master-TOC having structures for storing information for determining the position of the sub-TOCs.

11. The method of claim 10, further comprising the step of:

storing the information items in the track area;

storing in each of the sub-TOC structures the configuration of each of the information items including the content and position of the information items in the track area;

storing in the master-TOC structures the information for determining the position of the at least two mutually logically conforming sub-TOCs.

12. The method of claim 10, wherein the information items include audio information.

13. The method of claim 10, wherein the unitary storage medium is an optical disc.

14. The method of claim 10, wherein the information is stored by pressing consumer discs from a master disc.

15. The method of claim 10, wherein the information is stored using an optical write head.

16. The method of claim 10, wherein two sub-TOCs assigned to the track area are positioned at opposite ends of the track area.

17. The method of claim 10, wherein the number of sub-TOCs assigned to the track area is exactly 2.

18. The method of claim 10, wherein the master-TOC is positioned at a predetermined offset location with respect to an initial location on the medium.

19. The method of claim 10, wherein the mutually logically conforming sub-TOCs are identical.

20. The method of claim 10, wherein the information in one of the at least two mutually logically conforming sub-TOCs is a bitwise inversion of the information in another of the at least two mutually logically conforming sub-TOCs.

21. The method of claim 10, wherein:

the method further comprises the step of: storing the information items in the track area; storing in both the sub-TOCs structures the information for determining the content and position of each information item in the track area; storing in the master-

TOC structures the information for determining the position of the at least two mutually logically conforming sub-TOCs;

the information items include audio information;

the storage medium is an optical disc;

the information is recorded using a method selected from one or more of: pressing consumer discs from a master disc; using an optical write head;

two sub-TOCs assigned to a track area are positioned at opposite ends of the track area;

a sub-TOC assigned to a track area positioned at one end of the track area is separated from the one end of the track area by a gap;

the number of sub-TOCs assigned to a track area is exactly 2;

the master-TOC is positioned at a predetermined offset location with respect to an initial location on the medium;

the mutually logically conforming sub-TOCs contain information selected from: identical information; and equivalent bitwise inverted information;

the storage medium also includes a file structure, and the information items may be accessed using either the TOC structure or the file structure;

the file system for audio information conforms to a standard selected from: UDF, and ISO 9660;

the file structure includes a root directory that points to the master-TOC and to sub-directories;

the sub-directories include a sub-directory containing stereo audio information items and another sub-directory containing audio information items having three or more channels; and

the storage of the audio information is selected from one or more of: a lossless compression format; and a lossy compression format.

22. A unitary storage medium, comprising:

one or more track areas;

at least two mutually logically conforming sub-TOCs assigned to a track area, each sub-TOC having information structures for storing information specifying the configuration of the same information items stored in the track area, thereby allowing retrieving the configuration information for the same information item in the track area from at least any correct copy of the sub-TOCs; and

at least one master-TOC with information structures for storing information for determining the positions of each of the mutually logically conforming sub-TOCs.

23. The medium of claim 21 in which the medium is an optically readable disc.

24. The medium of claim 21, wherein:

information items are stored in the track areas; the information for determining the configuration of each information item in the track area is stored in each sub-TOC; and the information for determining the position of the at least two mutually logically conforming sub-TOCs is stored in the master-TOC; the information items include audio information;

the information is recorded using a method selected from one or more of: pressing consumer discs from a master disc; using an optical write head;

two sub-TOCs assigned to a track area are positioned at opposite ends of the track area;

a sub-TOC assigned to a track area positioned at one end of the track area is separated from the one end of the track area by a gap;

the number of sub-TOCs assigned to a track area is exactly 2;

the master-TOC is positioned at a predetermined offset location with respect to an initial location on the medium;

the mutually logically conforming sub-TOCs contain information selected from: identical information; and equivalent bitwise inverted information;

the storage medium also includes a file structure, and the information items may be accessed using either the TOC structure or the file structure;

the file system for audio information conforms to a standard selected from: UDF; and ISO 9660;

the file structure includes a root directory that points to the master-TOC and to sub-directories;

the sub-directories include a sub-directory containing stereo audio information and a sub-directory containing audio information having three or more channels; and

the storage of the audio information is selected from one or more of: a lossless compression format; and a lossy compression format.

25. Apparatus for controlling a reading device, comprising:

first control means for positioning a read head at information items stored in a track area of one or more track areas of a unitary storage medium, depending on configuration information read at times from each of at least two mutually logically conforming sub-TOCs assigned to the track area, each of the sub-TOCs specifying the configuration of the same information items stored in the track area, thereby allowing retrieving the configuration information for the same information items from at least any correct copy of the at least two sub-TOCs; and

second control means for positioning the read head at times at each of the at least two sub-TOCs depending on position information read from at least one master-TOC.

26. The reading control apparatus of claim 25 in which:

- the storage medium is an optically readable disc;
- the information items include audio information;
- the information is recorded using a method selected from one or more of: pressing consumer discs from a master disc; using an optical write head;
- two sub-TOCs assigned to a track area are positioned at opposite ends of the track area;
- a sub-TOC assigned to a track area positioned at one end of the track area is separated from the one end of the track area by a gap;
- the number of sub-TOCs assigned to a track area is exactly 2;
- the master-TOC is positioned at a predetermined offset location with respect to an initial location on the medium;
- the mutually logically conforming sub-TOCs contain information selected from: identical information; and equivalent bitwise inverted information;
- the storage medium also includes a file structure, and the information items may be accessed using either the TOC structure or the file structure;
- the file system for audio information conforms to a standard selected from: UDF; and ISO 9660;
- the file structure includes a root directory that points to the master-TOC and to sub-directories;
- the sub-directories include a sub-directory containing stereo audio information items and a sub-directory containing audio information items having three or more channels; and
- the storage of the audio information is selected from one or more of: a lossless compression format; and a lossy compression format.

27. Apparatus for controlling a recording device with a write head, comprising:

first control means for positioning a write head to write information items in a track area of one or more track areas of a unitary storage medium, and writing the information items in the track area; and

second control means for positioning the write head to write configuration information for the information items at times in each of at least two mutually logically conforming sub-TOCs assigned to the track area, and writing in each sub-TOC the configuration information for the same information items written in the track area, thereby allowing retrieving configuration information for the same information item from at least any correct copy of the mutually logically conforming sub-TOCs.

28. The recording device control apparatus of claim 27 in which:

the controller further comprising third control means for positioning the read head at a master-TOC, and writing information in information structures of the master-TOC for determining the position of each sub-Toc for the write area;

the storage medium is an optically readable disc;

the information items include audio information;

two sub-TOCs assigned to a track area are positioned at opposite ends of the track area;

a sub-TOC assigned to a track area positioned at one end of the track area is separated from the one end of the track area by a gap;

the number of sub-TOCs assigned to a track area is exactly 2;

the master-TOC is positioned at a predetermined offset location with respect to an initial location on the medium;

the mutually logically conforming sub-TOCs contain information selected from: identical information; and equivalent bitwise

inverted information;

the storage medium also includes a file structure, and the information items may be accessed using either the TOC structure or the file structure;

the file system for audio information conforms to a standard selected from: UDF; and ISO 9660;

the file structure includes a root directory that points to the master-TOC and to sub-directories;

the sub-directories include a sub-directory containing stereo audio information items and a sub-directory containing audio information items having three or more channels; and

the storage of the audio information is selected from one or more of: a lossless compression format; and a lossy compression format.

29. A reading device for a unitary media, comprising:

a read head for reading information from one or more track areas of a track of an optical disc;

a disc driver for driving the track with respect to the read head;

a clamping device for holding the disc in relation to the disc driver;

control means for controlling the reading device

the control means positioning a read head with respect to the track depending on configuration information including position information read at times from each of at least two mutually logically conforming sub-TOCs assigned to each track area, each sub-TOC specifying the configuration of each information item stored in the track area, thereby allowing retrieving configuration information for any information items from at least any correct copy of the mutually logically conforming sub-TOCs; and

the control means positioning the read head at each of the at

least two sub-TOCs depending on position information read from at least one master-TOC.

30. The reading device of claim 29 in which:

the storage medium is an optically readable disc;

the information items include audio information;

the information is recorded using a method selected from one or more of: pressing consumer discs from a master disc; using an optical write head;

two sub-TOCs assigned to a track area are positioned at opposite ends of the track area;

a sub-TOC assigned to a track area positioned at one end of the track area is separated from the one end of the track area by a gap;

the number of sub-TOCs assigned to a track area is exactly 2;

the master-TOC is positioned at a predetermined offset location with respect to an initial location on the medium;

the mutually logically conforming sub-TOCs contain information selected from: identical information; and equivalent bitwise inverted information;

the storage medium also includes a file structure, and the information items may be accessed using either the TOC structure or the file structure;

the file system for audio information conforms to a standard selected from: UDF; and ISO 9660;

the file structure includes a root directory that points to the master-TOC and to sub-directories;

the sub-directories include a sub-directory containing stereo audio information items and a sub-directory containing audio information items having three or more channels; and

the storage of the audio information is selected from one or more of: a lossless compression format; and a lossy compression

format.

31. A recording device for a unitary storage medium, comprising:
a master disc;

means for pressing consumer discs from the master disc to
record the consumer discs;

and in which the master disc includes:

one or more track areas;

at least two mutually logically conforming sub-TOCs assigned
to a track area, each sub-TOC having information structures
specifying the configuration of each information item stored in the
track area, thereby allowing retrieving the configuration of any
information item at least from any correct copy of the sub-TOCs;
and

at least one master-TOC with information structures specifying
the positions of each of the mutually logically conforming sub-
TOCs.

32. The recording device of claim 31 in which:

the storage medium is an optically readable disc;

the information items include audio information;

the information items are recorded using an optical write head
in the process for producing the master disc;

two sub-TOCs assigned to a track area are positioned at
opposite ends of the track area;

a sub-TOC assigned to a track area positioned at one end of
the track area is separated from the one end of the track area by a
gap;

the number of sub-TOCs assigned to a track area is exactly 2;

the master-TOC is positioned at a predetermined offset
location with respect to an initial location on the medium;

the mutually logically conforming sub-TOCs contain information

selected from: identical information; and equivalent bitwise inverted information;

the storage medium also includes a file structure, and the information items may be accessed using either the TOC structure or the file structure;

the file system for audio information conforms to a standard selected from: UDF; and ISO 9660;

the file structure includes a root directory that points to the master-TOC and to sub-directories;

the sub-directories include a sub-directory containing stereo audio information items and a sub-directory containing audio information items having three or more channels; and

the storage of the audio information is selected from one or more of: a lossless compression format; and a lossy compression format.

33. A recording device with a write head for a unitary storage medium, comprising:

a write head for recording information on one or more track areas of a track of an optical disc;

disc driver for driving the track with respect to the write head;

a clamping device for holding the disc fixed in relation to the disc drive means;

control means for controlling the recording device;

the control means positioning the write head at times to write the information items in a track area and for subsequently writing the information items in the track area;

the control means positioning the write head at times to write, in at least two mutually logically conforming sub-TOCs assigned to each track area, configuration information of the information items, each sub-TOC having structures for storing

configuration information for each of the information items stored in the track area, and for subsequently writing the information item configuration information into the sub-TOC structures, thereby allowing retrieving configuration information for any information items from at least any correct copy of the mutually logically conforming sub-TOCs.

34. The recording device of claim 33 in which:

the control means position the write head to write, in at least one master-TOC, information for determining the positions of the sub-TOCs, the master-TOC having structures for storing the information for determining the positions of each sub-TOC, and for writing the sub-TOC position determining information into the master-TOC structures;

the control means position the write head to write at least two mutually logically conforming sub-TOCs for the same track area of the unitary storage medium, each sub-TOC having structures for storing information for determining the configuration of each information items stored in the track area, thereby allowing retrieving the configuration of any information item in the track area from at least any correct copy of the sub-TOCs;

the control means position the write head to write at least one master-TOC having structures for storing information for determining the position of the sub-TOCs;

the write head is a read/write head used for reading information from the medium and writing information to the medium;

the control means position the write head to read the information items stored in the track area depending on configuration information read at times from each of the mutually logically conforming sub-TOCs assigned to the track area, each of the sub-TOCs specifying the configuration of the same information items stored in the track area, thereby allowing retrieving the

configuration information for the same information items from at least any correct copy of the at least two sub-TOCs; the control means control the reading of each information item by the write head positioned at the information item in the track area;

the control means position the write head at times to read the information item configuration information at times from each of the sub-TOCs depending on position information read from the master-TOC; the control means control the reading of the configuration information by the write head positioned at each sub-TOC;

the control means position the write head at times to read the position information of the sub-TOCs from the master-TOC and control the reading of the position information from the master-TOC;

the storage medium is an optically readable disc;

the information items include audio information;

two sub-TOCs assigned to a track area are positioned at opposite ends of the track area;

a sub-TOC assigned to a track area positioned at one end of the track area is separated from the one end of the track area by a gap;

the number of sub-TOCs assigned to a track area is exactly 2;

the master-TOC is positioned at a predetermined offset location with respect to an initial location on the medium;

the mutually logically conforming sub-TOCs contain information selected from: identical information; and equivalent bitwise inverted information;

the storage medium also includes a file structure, and the information items may be accessed using either the TOC structure or the file structure;

the file system for audio information conforms to a standard selected from: UDF; and ISO 9660;

the file structure includes a root directory that points to the master-TOC and to sub-directories;

the sub-directories include a sub-directory containing stereo audio information items and a sub-directory containing audio information items having three or more channels; and

the storage of the audio information is selected from one or more of: a lossless compression format; and a lossy compression format.

35. An optical disc for storing audio-centered information on a unitary storage medium using a Table-of-Contents (TOC) mechanism for therein specifying an actual configuration of various audio items on the medium, produced by the method of:

assigning at least two mutually logically conforming Sub-TOCs to each one of a set of one or more Track Areas on the unitary storage medium, thereby allowing retrieving any constituent Sub-TOC part from at least any correct copy of the Sub-TOCs; and

providing at least one Master-TOC for specifically pointing to each of the Sub-TOCs.

REMARKS

The claims have been amended to delete all multiple dependencies and put the claims in commonly used US format. Entry prior to calculating the filing fee according to MPEP §506, is respectfully solicited.

Respectfully submitted,

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January 25, 2002

APPENDIX Mark-Up Of Amended Portions Of The Specification

The paragraph beginning on page 1, line 9 is amended to read as follows.

~~The invention relates to a method as recited in the preamble of Claim 1.~~ Storing digital audio on unitary media such as disc or tape is widespread. In case of actual sub-division of the audio into multiple sub-items, providing a **Table-of-Contents** (TOC) allows to access the information in an easy manner. Such TOC will specify at least **what** has been stored and **where** it has been stored. The audio may be defined according to various standardized audio formats, such as two-channel stereo, multiple (5-6) channel audio such as in surround sound applications, and possibly others. An audio provider may wish to combine various track areas having the same and/or different such formats on a single medium such as an optical disc.

The paragraph beginning on page 1, line 20 is amended to read as follows.

In consequence, amongst other things, it is an object of the present invention to allow an audio management system to allow a user to access various audio track areas in a fast and easy manner. ~~Now therefore, according to one of its aspects the invention is characterized according to the characterizing part of Claim 1.~~ A user is now able to distinguish between various track areas and to navigate among the various items of a single track area in a robust manner, and if possible, without encumbrance through data errors in the TOC itself.

The paragraph beginning on page 2, line 5 is amended to read

as follows.

Figures 1a, and 1b depict a record carrier of the invention ;

Figure 2 depicts a playback device of the invention ;

Figure 3 depicts a recording device of the invention ;

Figure 4 depicts a file system for use with the invention used in the record carrier of figure 1;

Figure 5 depicts a storage arrangement invention used in for the record carrier of figure 1 invention; and

Figure 6 depicts a data structure invention for of an audio area of the record carrier in figure 1.